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A New Subgenus and a New Species of *Holospira* (Gastropoda: Pulmonata: Urocoptidae) from Sonora, Mexico

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Abstract. *Holospira* (***Millerella***) ***hoffmani*** Gilbertson & Naranjo-García, sp. nov. from the Sierra Batamote of eastern Sonora, Mexico, and the new subgenus ***Millerella*** are described. *Holospira milleri* Gilbertson, 1989, is transferred from *Holospira, sensu stricto* to ***Millerella*** subgen. nov.

INTRODUCTION

Several holospiras have been described from the northwestern Mexican state of Sonora. Species representing four (of seven) subgenera are extant in this state alone (Gilbertson, 1993), including *Holospira, sensu stricto* von Martens, 1860; *Allocoryphe* Pilsbry, 1953; *Eudistemma* (Dall, 1896); and *Sonoraloa* Gilbertson, 1993. With the exception of *Sonoraloa,* these subgenera were described solely on the basis of shell characters.

Recent investigations have focused on variations of the reproductive organs of holospiras from this region. Data gleaned from these studies have been useful in classification, especially at the subgeneric level (Gilbertson, 1993). In this regard, the present new species exhibits a reproductive anatomy that is unlike that of all of the other *Holospira* species for which the anatomy is known except that of *H. milleri* Gilbertson, 1989, another Sonoran species.

MATERIALS AND METHODS

Three snails were drowned and their shells were broken carefully and removed, leaving the soft anatomy intact. The reproductive system of each snail was then dissected free from the other internal organs. It was stained with Delafield Hematoxylin, destained with 3% acid alcohol, counter-stained with Eosin-Y, and placed between a slide and a cover slip. Then it was dehydrated in a series of three changes (jars) of absolute ethanol and, for clearing, in a change of 50% absolute ethanol and 50% toluene and three more changes of 100% toluene. The stained reproductive system was then permanently slide-mounted in Permount (Gregg, 1959; Naranjo-García, 1989).

SYSTEMATICS

Family UROCOPTIDAE Pilsbry & Vanatta, 1898

Subfamily HOLOSPIRINAE Pilsbry, 1946

Genus *Holospira* von Martens, 1860

Subgenus ***Millerella*** Gilbertson & Naranjo-García, subgen. nov.

Type species: *Holospira milleri* designated herein. It is transferred from *Holospira, sensu stricto.*

Distribution: Mexico, east-central Sonora.

Diagnosis: Shell umbilicate, cylindroconic to turriform in shape. Embryonic whorls rounded, tapering toward apex. Internal column moderately slender to slender, lamellate. Armature of three to four lamellae in penultimate whorl. Male genitalia with short, conic verge present in small penial sac; epiphallus limited to short enlargement of vas deferens atop penial sac. Vagina and spermathecal diverticulum lacking.

Etymology: This subgenus is named for Dr. Walter B. Miller, a distinguished student of North American land snails and a generous mentor.

Remarks: The new subgenus is erected for the trilamellate *H. **hoffmani*** sp. nov. and the quadrilamellate *H. milleri* in order to reflect the similarities in many of their shell features and their nearly identical reproductive anatomies. The removal of *H. milleri* from *Holospira, sensu stricto* represents a partial revision of the nominate subgenus.

Holospira, sensu stricto is defined solely by the presence of all four internal lamellae (axial, parietal, basal, and palatal) in the penultimate whorl of the shell (see Pilsbry, 1903:72; 1946:115). However, this singular cri-

terion is superficial and results in a "form-subgenus." Recognizing this, Pilsbry later (1953:141) stated: "There is considerable diversity in size, shape and sculpture (of *Holospira, sensu stricto*), and probably several subgenera will eventually be recognized." (The nominate subgenus is still represented in Sonora by *H. cyclostoma* Pilsbry, 1953. However, this species is known only from shell material extracted from river drift. Analysis of its internal organs is not possible until living populations are located.)

The other subgenera of *Holospira* are characterized by species that exhibit only one internal lamella (the axial), or none, except for *Eudistemma* (see Bequaert & Miller 1973:138) and *Prionoplax* Pilsbry, 1953. In *Eudistemma*, species may have one, two, or three lamellae (axial, basal, parietal) in the penultimate whorl and they often show great intraspecific variability with respect to their number, strength, and length. Some specimens of *H. (E.) crossei* Dall, 1895, and *H. (E.) montivaga* Pilsbry, 1946, are even alamellate (Pilsbry, 1946:122). *Prionoplax* is trilamellate, but the parietal lamella is three to four whorls long and serrate. The only species, *H. (P.) odontoplax* Pilsbry, 1953, would have been placed in genus *Propilsbrya* Bartsch, 1906, which it otherwise resembles, except for the presence of a basal lamella.

The embryonic whorls of ***Millerella*** are rounded, unlike those of *Allocoryphe* in which they are characteristically angular at the upper-outer margin giving a flattened, straight-sided appearance. Also, these whorls increase in width (taper toward apex) unlike those of *H. kinonis* Baily & Baily, 1940, a species collected in river drift near Guaymas, Sonora (subgeneric status uncertain; Gilbertson, 1993) in which they are of nearly equal size.

The reproductive systems of 16 *Holospira* spp. representing five of the seven subgenera (*Allocoryphe*; *Bostrichocentrum* Strebel & Pfeiffer, 1880; *Eudistemma*; *Holospira, sensu stricto*; and *Sonoraloa*) have been published (Gilbertson, 1989a,b, 1993; Pilsbry 1903:70–71, pls. 19, 27; Thompson, 1964). This system is also known from *H. mesolia* Pilsbry, 1912 (personal observation, LHG), which is assigned to *Haplocion* Pilsbry, 1902. The male anatomy of ***Millerella*** differs from the anatomies of these other subgenera in two distinct respects: (1) it exhibits a verge in the penial sac and (2) it lacks a tubular epiphallus. The lack of a tubular epiphallus results in a very short distal portion of the male duct system. In addition, ***Millerella*** lacks the spermathecal diverticulum (appendix) of the female system characteristic of *Bostrichocentrum, Eudistemma,* and two (of three) species of *Holospira, sensu stricto* for which the anatomy is known (*H. nelsoni* Pilsbry, 1903 and *H. sherbrookei* Gilbertson, 1989). The one remaining species of the nominate subgenus that has been anatomically described, *H. goldfussi* (Menke, 1847), lacks this diverticulum but exhibits a "capacious vagina" (Pilsbry, 1903).

Holospira (***Millerella***) ***hoffmani*** Gilbertson & Naranjo-García, sp. nov.

(Figures 1–3)

Diagnosis: Shell small for genus, umbilicate, cylindroconic to turriform in shape, trilamellate. Internal column moderately slender, lamellate. Embryonic whorls rounded; whorls of cone convex. Male genitalia with short, non-tubular epiphallus and a conic verge in small penial sac.

Description of shell of holotype (Figure 1A, B, D): Shell moderately small for genus, umbilicate, cylindroconic in shape with slightly convex spire merging very gradually into cone, cream in color. Whorls 11.5 in number. Embryonic whorls 2.3 in number, rounded, minutely granular, tapering toward apex. Whorls of the cone approx. 5 in number, convex with greatest diameter below midline giving a somewhat sloping appearance. Whorls of cylindric portion also convex with greatest diameter near midline. Retractively slanted ribs prominent on all post-embryonic whorls, with intercostal spaces approx. 1.5 width of rib. Ribs smoother on cylindric whorls. Aperture slightly auriculate; peristome expanded (except at upper-outer margin) and slightly extended from body whorl. Greatest length 9.6 mm; greatest width 3.5 mm. Umbilicus 0.6 mm in diameter.

Internal shell structure (Figure 1C): Internal column moderately slender (approx. 0.17 diameter of shell in third whorl), hollow, not enlarging apically, with strong lamella in penultimate whorl above aperture (approx. 0.5 of whorl). Parietal lamella well developed, flaring outward (approx. 0.3 of whorl); basal lamella weak (approx. 0.3 of whorl). Palatal lamella lacking.

Variations of paratypes: Thirty-six paratypes range from short and conic (8.2 × 3.5 mm) to elongate and turriform (11.2 × 3.4 mm). They average 9.7 mm in greatest length and 3.5 mm in greatest diameter.

Sixty additional shells (SBMNH No. 74815) from a nearby location (within approx. 1 km) exhibit a more pronounced slope of the body whorls giving the appearance of overhanging at the sutures. These shells were collected by W. B. and W. N. Miller on 19 August 1965. (Locality data on label as follows: Sonora, N of Mina El Milagro, Sierra del Santo Nino, 12.7 mi. [21.2 km] from lower bridge at El Novillo [toward] Sahuaripa; in limestone rocks; ca. 4,000 ft.)

Description of reproductive anatomy: Description based on specimen illustrated in Figures 2, 3 (Santa Barbara Museum of Natural History slide no. 143994). Vas deferens enlarging into epiphallus only as it enters penial complex. Penial sac (penis) very short, narrowing basally, with small, apical, conic verge (slanting in illustrated specimen). Penial retractor muscle moderate in size, inserting atop penial sac adjacent to entrance of epiphallus.

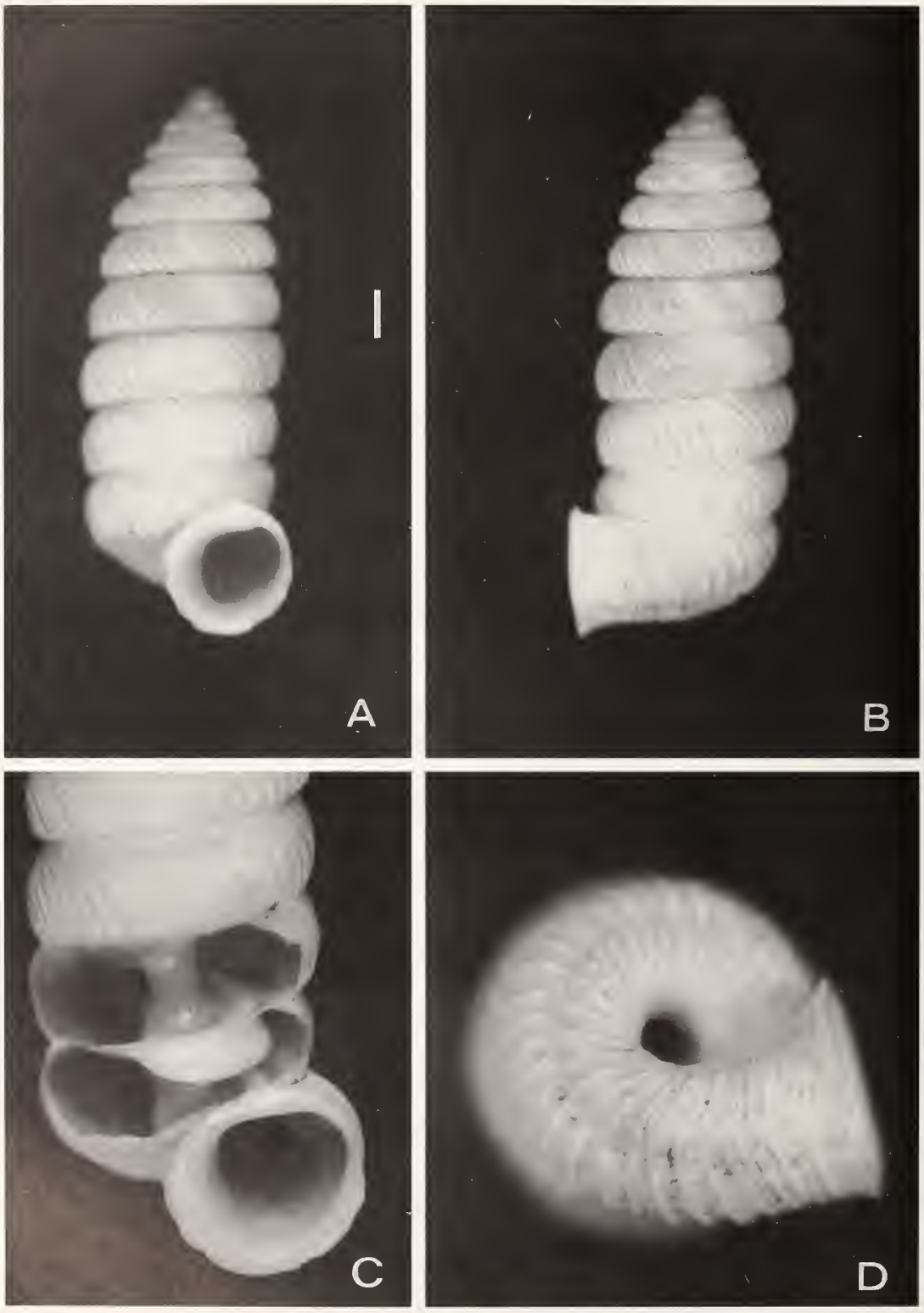

Figure 1

Holospira ***hoffmani*** Gilbertson & Naranjo-García, sp. nov., holotype, Santa Barbara Museum of Natural History No. 143186, apertural view (A), side view (B), and basal view (D). C. Internal view of paratype. Scale bar for A and B = 1 mm.

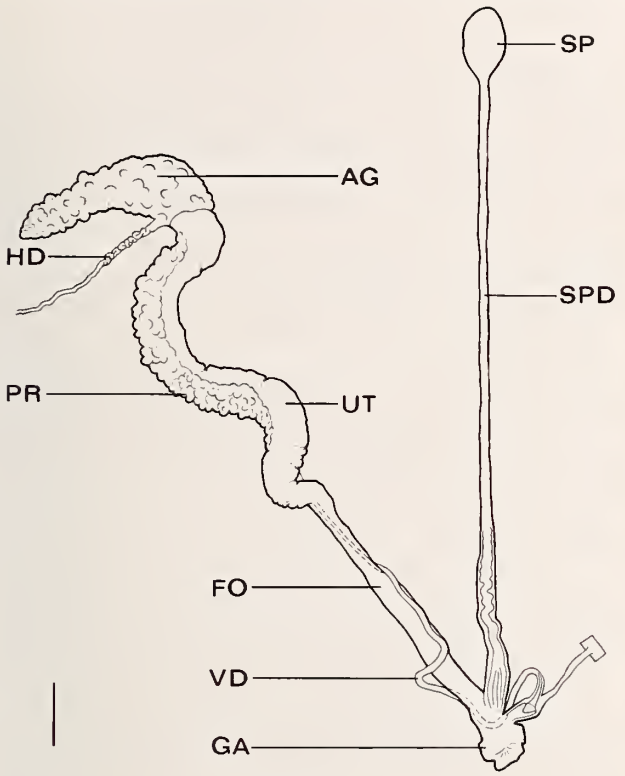

Figure 2

Reproductive system of *Holospira **hoffmani*** Gilbertson & Naranjo-García, sp. nov. Specimen collected at type locality, 3 January 1988. SBMNH slide No. 143994. Abbreviations: AG, albumen gland; FO, free oviduct; GA, genital atrium; HD, hermaphroditic duct; PR, prostate gland; SP, spermatheca; SPD, spermathecal duct; UT, uterus; VD, vas deferens. Scale bar = 1 mm.

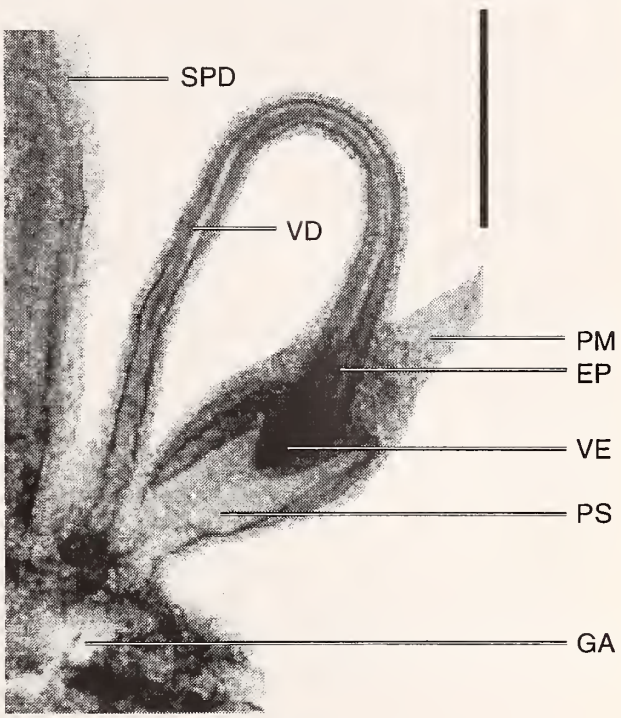

Figure 3

Male genitalia of *Holospira **hoffmani*** Gilbertson & Naranjo-García, sp. nov. SBMNH slide No. 143994. Abbreviations: EP, epiphallus; GA, genital atrium; PS, penial sac (penis); PM, penial retractor muscle; VD, vas deferens; VE, verge. SPD, spermathecal duct of female system. Scale bar = 0.4 mm.

Spermathecal duct enlarging basally with internal, undulated section immediately above base. Spermatheca ovoid; spermathecal diverticulum lacking. Free oviduct expanded with undulating vas deferens alongside. Uterus typical with attached prostate gland. Hermaphroditic duct entering albumen gland near base.

Type locality: Mexico, east-central Sonora, Sierra Batamote (near El Milagro Mine), 20.5 km E of the Rio Yaqui Bridge along Hwy. 15 from La Estrella to Bacanora, 28°57.5′N, 109°30.5′W, approx. 1070 m elevation.

This is a fairly steep, rocky, south-facing slope beneath cliffs. Snails were found estivating under surface rocks (3 January, 1988). Specimens of *Holospira remondi laevior* Pilsbry, 1953, were collected at the same site (see Gilbertson, 1993:73).

Etymology: This species is named for our friend and colleague, southwestern (U.S.) malacologist, Dr. James E. Hoffman.

Disposition of types: Holotype: Santa Barbara Museum of Natural History No. 143186. Paratypes: Academy of Natural Sciences of Philadelphia No. 399396, Florida Museum of Natural History No. 264417, Los Angeles County Museum of Natural History No. 2805, National Museum of Natural History—Smithsonian Institution No. 860750, Santa Barbara Museum of Natural History No. 74815, Universidad Nacional Autónoma de México, Colección Nacional Mollusca No. 533, University of Texas at El Paso No. 13628, Edna Naranjo-García Collection No. 642.

Remarks: *Holospira (**Millerella**) **hoffmani*** resembles *H. milleri* with regard to the morphology of several shell features including that of the embryonic whorls, internal lamellae (except palatal), peristome, aperture, and umbilicus. Conversely, these two species differ from each other in four main respects: (1) the shape of their post-embryonic whorls (*H. milleri* exhibits extremely convex, subcarinate, post-embryonic apical whorls), (2) rib thickness (*H. milleri* is more finely rib-striate), (3) number of internal lamellae, and (4) shell size and shape (*H. milleri* is longer and more turriform). Also, the internal column and umbilicus are somewhat more narrowed in *H. milleri.*

The reproductive systems of *Holospira **hoffmani*** and

H. milleri are nearly identical. However, *H. milleri* exhibits a slightly longer and more narrowed spermathecal duct and a reniform (rather than ovoid) spermatheca.

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